

6.8 PALEONTOLOGIC RESOURCES

This section provides an analysis of the paleontologic resources environment at the Morro Bay Power Plant (MBPP), which has been operational for more than 40 years. Previous use of the site and ongoing operations have involved facility modifications that have resulted in surface and subsurface disturbance throughout the site. As a result, most of the area has already been disturbed, and the Project is unlikely to impact paleontological resources.

The MBPP is located 12 miles northwest of San Luis Obispo, California, in San Luis Obispo County in the City of Morro Bay. The plant is situated west of Highway 1, near Morro Bay Harbor and east of Estero Bay. The area includes light industry, commercial operations, and marine, recreational and residential uses.

Paleontological resources are the fossilized remains of prehistoric plant and animal organisms, as well as the mineralized impressions (trace fossils) left as indirect evidence of the form and activity of such organisms. Under state and federal law, paleontological resources are considered to be nonrenewable resources.

Paleontological analysis was conducted by Petra Paleontology, located in Mission Viejo, California. The study was conducted to determine the presence of significant paleontological resources in the area of Project activities, in compliance with the Rules of Practice and Procedure and Power Plant Site Certification Regulations (California Energy Commission [Commission], 1997). This analysis also complies with the 1989 guidelines and significance criteria specified by the Society for Vertebrate Paleontology (SVP), a national professional organization. The qualified paleontologist who conducted the assessment for this Project is F. Govean, Ph.D. Dr. Govean's résumé is provided in Appendix 6.8-1.

The beneficial aspects of the Project related to paleontological resources are as follows:

- Project activities will be performed primarily within existing property boundaries, on previously disturbed land.
- The paleontological resource analysis and survey conducted for the Project found no evidence of significant paleontological resources in the areas of Project activities.
- There are no fossil vertebrate or invertebrate localities within the Project area.

This section presents a summary of the technical report, *Paleontological Resource Assessment, Morro Bay Power Plant Expansion, Morro Bay, San Luis Obispo County, California*, provided in Appendix 6.8-2. The report presents the results of a paleontological archival search, literature

review, and field survey completed specifically for the Project. Detailed information regarding the geologic setting, formations and stratigraphy, paleontologic sensitivity, and findings of the field reconnaissance is presented and referenced in the technical report .

6.8.1 EXISTING CONDITIONS

6.8.1.1 Project Area

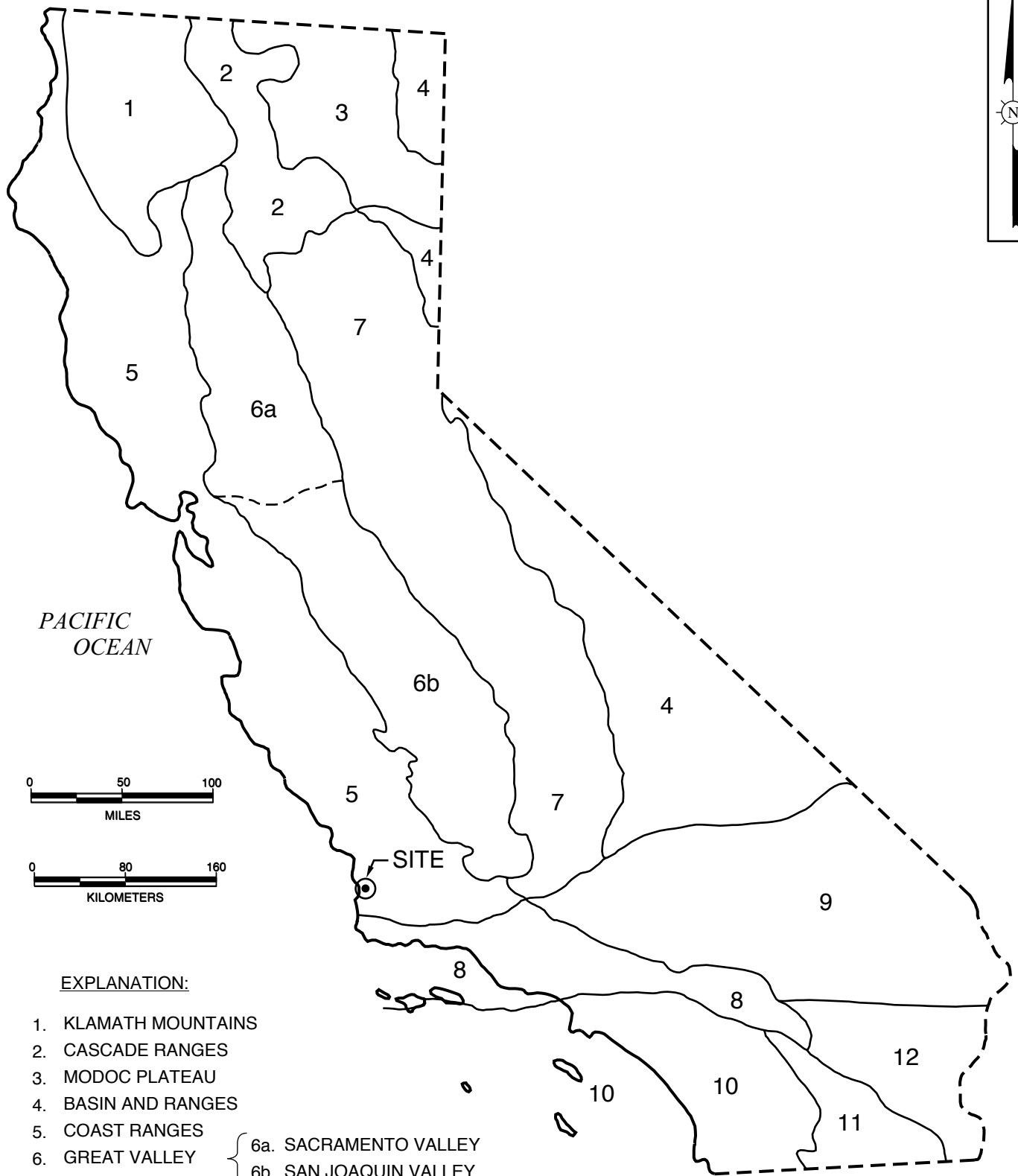
The MBPP site is situated on Morro Bay, on the northwestern edge of the city of Morro Bay. Morro Creek drains southwest toward MBPP and traverses the western part of the property about 400 feet west of the onsite fuel oil tank farm. A ridge of older dune materials abuts MBPP on the east. Recent dune deposits are located along the southwest MBPP boundary and the perimeter of Morro Bay. Highway 1 borders the site on the northeast.

The MBPP fuel oil storage tank farm is situated in earthen catch basins that are rimmed by earthen berms. The berm slopes are mainly covered with ice plant. The tank catch basin floors consist primarily of exposed soils and sands. An asphalt access road rims the storage tanks.

6.8.1.2 Geologic Setting and Stratigraphy

The MBPP is located in the southern part of the Coast Ranges Geomorphic Province, shown in Figure 6.8-1. The structure of this area, and for most of coastal and central California, is strongly influenced by the northwest-trending San Andreas Fault Zone.

The Franciscan Complex of oceanic and terrigenous rocks forms the core of much of the Coast Range and is the basement rock in the region of MBPP (see Figure 6.8-2). The Franciscan Formation is a melange of volcanic rocks, such as tuffs and dacites, intermixed with oceanic crust of marine sandstones and deep-sea cherts and ultramafic rocks, such as serpentinite and other altered rocks. These rocks range in age from the late Jurassic (140-million years Before Present) to the late Cretaceous (75-million years Before Present). Overlying the Franciscan Complex in the San Luis Range is Miocene age (10- to 25-million years Before Present) Obispo Formation. The Obispo Formation is comprised of marine siliceous shales and cherts interbedded with thin sandstone units. As shown in Figure 6.8-3, the most prominent geologic feature in the vicinity of MBPP is Morro Rock, an eroded volcanic neck composed of dacite.



EXPLANATION:

1. KLAMATH MOUNTAINS
2. CASCADE RANGES
3. MODOC PLATEAU
4. BASIN AND RANGES
5. COAST RANGES
6. GREAT VALLEY { 6a. SACRAMENTO VALLEY
6b. SAN JOAQUIN VALLEY
7. SIERRA NEVADA
8. TRANSVERSE RANGES
9. MOJAVE DESERT
10. PENINSULAR RANGES
11. SALTON TROUGH
12. COLORADO DESERT

SOURCE: MODIFIED AFTER NORRIS & WEBB, 1976

**PHYSIOGRAPHIC PROVINCES
OF CALIFORNIA**

DUKE ENERGY MORRO BAY LLC
MORRO BAY POWER PLANT

TRC

FIGURE 6.8-1

Within the MBPP site, the Franciscan Formation lies at approximately 55 feet in depth and is overlain by two surficial geologic units, Quaternary alluvium (Qal) and Older dune sands (Qs). The Qal sediments were deposited primarily by Morro Creek and Willow Camp Creek, the major sediment sources for the area. The Qs, which were deposited by winds, form a ridge on the eastern perimeter of MBPP.

These surficial geologic units are overlain by locally dredged fill that was spread over the surface of MBPP and the surrounding tidal flats in 1941 and 1942. The artificial fill was placed by the United States Navy, raising the elevation of both the tidal flats and MBPP to about 15 feet. The average depth of fill at MBPP is approximately 8 feet.

6.8.1.3 Paleontologic Sensitivity

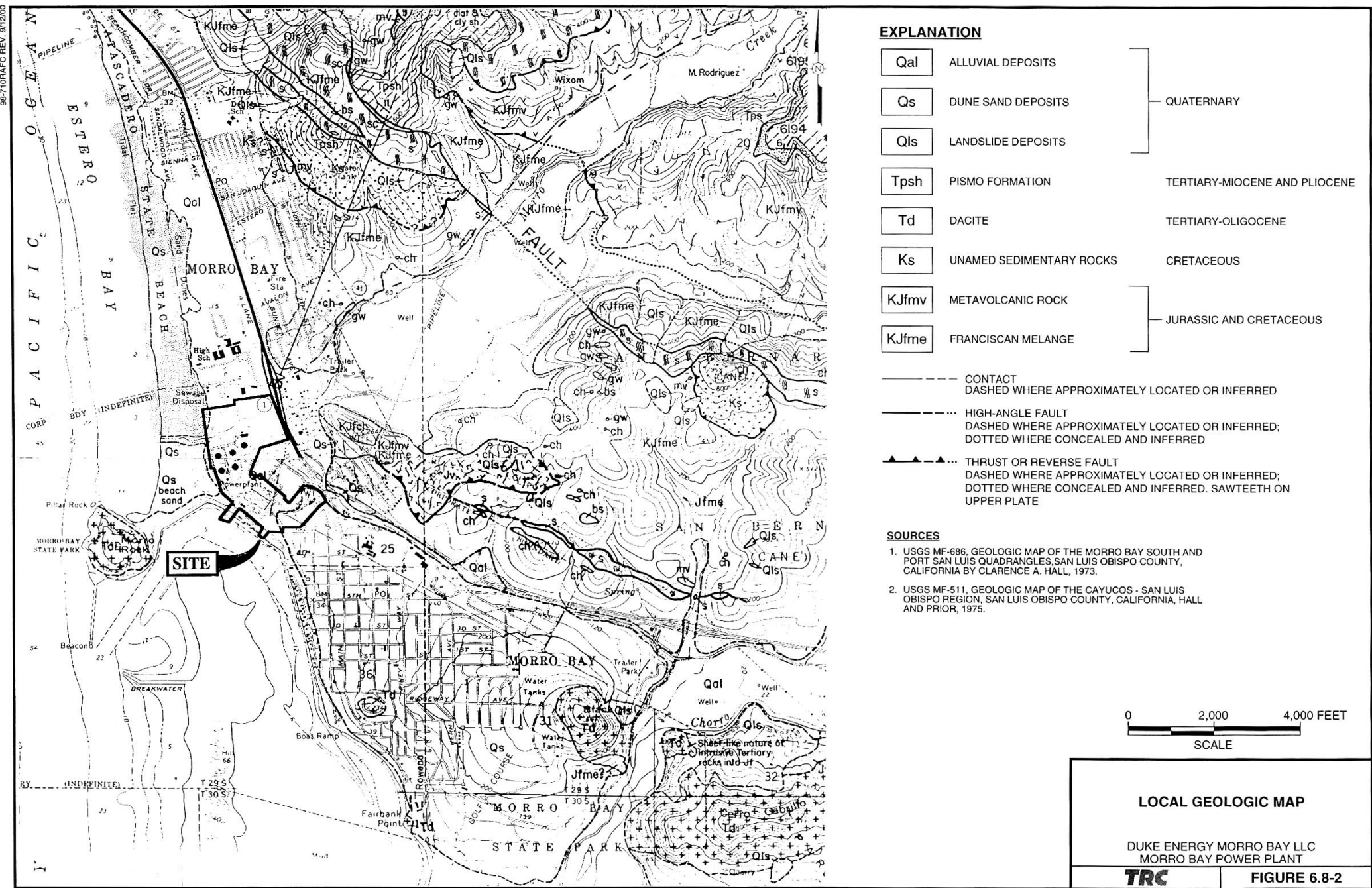
Paleontologic sensitivity is the potential for a geologic unit to produce scientifically significant fossils, as determined by rock type, past history of the rock unit in producing fossil materials, and fossil sites that are recorded in the unit. A paleontologic sensitivity rating is derived from fossil data from the entire geologic unit, not just from a specific survey area.

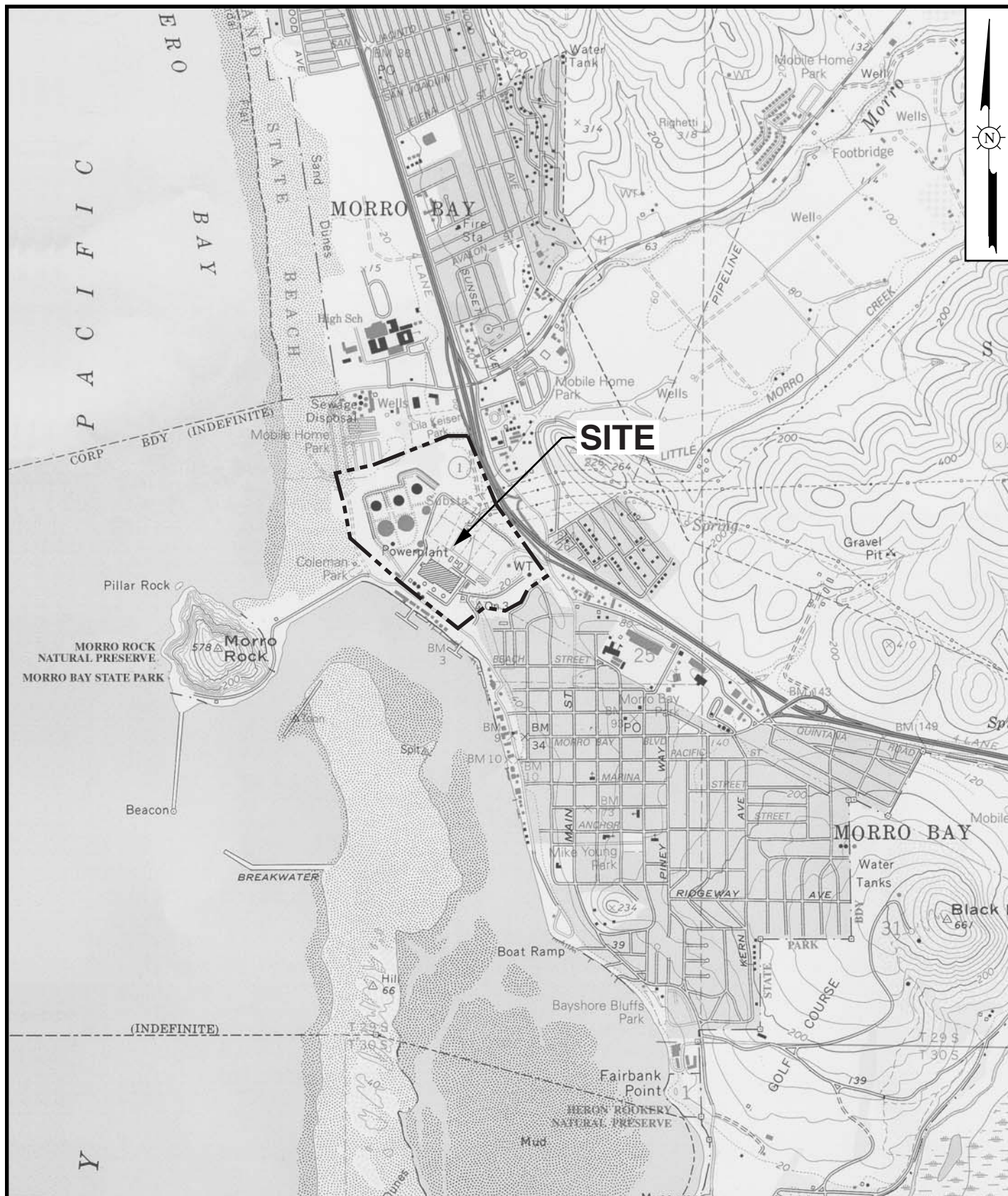
A three-fold classification of sensitivity, labeled as high, low and indeterminate, is used in California and recommended by the SVP, as follows:

- **High Sensitivity** - Indicates fossils are currently observed onsite, localities are recorded within the study area and/or the unit has a history of producing numerous significant fossil remains.
- **Low Sensitivity** - Indicates significant fossils are not likely to be found because of random fossil distribution pattern, extreme youth of the rock unit and/or the method of rock formation, such as alteration by heat and pressure.
- **Indeterminate Sensitivity** - Unknown or undetermined status indicates that the rock unit either has not been sufficiently studied or lacks good exposures to warrant a definitive rating. This rating is treated initially as having a high sensitivity or potential. After study or monitoring, the unit may fall into one of the other categories.

Other professionals expand the previous classification to include up to three additional ratings of very high, moderate and no sensitivity, as follows:

- **No Sensitivity** - Some paleontologists use this for crystalline rock units such as igneous rocks, where the rock forms from molten magma, which would preclude fossil preservation.
- **Moderate Sensitivity** - Applied by some to geologic units that have a history of producing meager fossil collections.





0 2,000 4,000 FEET

SCALE
SCALE: 1: 24,000

REFERENCE: USGS 7.5 MINUTE TOPOGRAPHIC MAP OF MORRO BAY NORTH AND MORRO BAY SOUTH, CALIFORNIA, DATED 1993 AND 1994.

PALEONTOLOGY SURVEY AREA

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FIGURE 6.8-3

- **Very High Sensitivity** - May be warranted for a project that contains very well known and scientifically important localities. Another example would be if a known fossil bone bed is present or is predicted to be present.

6.8.1.4 Research Methods

Information was obtained from an archival record search of the MBPP site and vicinity from the University of California, Berkeley, Museum of Paleontology (UCMP). This archival search covered both invertebrate and vertebrate localities. Persons contacted included the collections managers of both invertebrate and vertebrate paleontology at UCMP. Other collections managers and paleontologists also were contacted to obtain archival data from the Los Angeles County Museum of Natural History and the Morro Bay Natural History Museum.

Paleontologic field surveys of MBPP were conducted on February 1, 1999, and March 18, 1999, by F. Govean, Ph.D. Within the MBPP site, exposed areas of the onsite fuel oil tank farm were examined for fossil remains. With representatives of Duke Energy and TRC, Dr. Govean drove through the larger project area looking specifically for additional rock exposures. The northern area of the MBPP site was examined, and the dune ridge along the eastern edge of the facility was walked. Areas on the southern frontage road and along the western edge of the site also were examined. The field surveys were supplemented by notes and photographs to document existing conditions.

6.8.1.5 Findings

The archival search did not reveal fossil vertebrate or invertebrate localities on or in the vicinity of MBPP. The nearest recorded locality is about 6 miles southeast of MBPP. The field surveys and search for materials resulted in the identification of shell material within disturbed sandy soils at the tank berms, and along the southern and eastern site perimeters. The materials were determined to be modern in origin. No fossil remains were observed.

6.8.2 IMPACTS

Significance criteria were determined based on California Environmental Quality Act (CEQA) Guidelines, Appendix G, Environmental Checklist Form (approved January 1, 1999) and on performance standards or thresholds adopted by responsible agencies. An impact may be considered significant if the Project results in:

- Disturbance or destruction of an intact fossil bed or removal of portions of it in a manner inconsistent with the standards of the SVP.

- Disturbance or destruction of significant vertebrate fossils.
- Disturbance or destruction of a unique paleontological resource or site.

6.8.2.1 Construction Impacts

Project construction and demolition activities, described in Chapter 2.0 - Project Description, will occur within areas of previously disturbed sediments and an approximately 8-foot depth of artificial fill, spread throughout most of the site. As a result, the Project is not likely to require excavation of previously undisturbed sediments.

Because the underlying rock units are of low paleontological sensitivity, they are not likely to be affected by Project construction or demolition. The underlying Qal and Qs at the site are rated a low sensitivity because their geologically youthful age precludes finding scientifically significant fossils *in situ* (see Table 6.8-1). Further, no invertebrate or vertebrate fossils have been recovered from these units in the area or on the Project site, and none was observed during the field survey. In addition, the artificial fill has no provenience.

As a result of the above, it is unlikely that Project-related excavations will expose, disturb or destroy any paleontologic specimens. However, during excavation activities, a qualified paleontologist will periodically monitor the investigation area. If fossil materials are encountered, work will be halted in the immediate area and a paleontologist will be retained to investigate the site, evaluate the fossil materials, and devise and, if necessary, implement a mitigation plan.

6.8.2.2 Operations and Maintenance Impacts

There are no fossil localities or clear evidence of fossil remains onsite that will be affected by Project operations and maintenance. Therefore, there are no expected operations-related impacts.

6.8.2.3 Cumulative Impacts

The list of cumulative offsite projects is shown in Section 6.1. Since these projects are located offsite, they have no bearing on the Project's paleontological resource impacts. Because the Project will not impact paleontological resources, there will be no cumulative impacts to paleontological resources from the onsite and offsite projects.

TABLE 6.8-1

GEOLOGIC TIME SCALE AND SEDIMENTARY UNITS

MORRO BAY POWER PLANT

AGE (Ma)	EPOCH	NORTH AMERICAN LAND MAMMAL AGE	CALIFORNIA PROVINCIAL STAGE	FORMATION MEMBER
.011	Holocene	Rancholabrean	Hallian	Quat. Alluvium/Dunes
	Pleistocene	-----45----- Irvingtonian	Wheelerian	N/A
	-----1.9-----	-----1.9-----	-----1.7-2.8----- Venturian Repettian	
5	Pliocene	Blancan -----4.8-----	-----5?-----	N/A
		Hemphillian	"Delmontian"	
	-----5.3-----	-----8.7-----		
		11.3	-----?-----	
10		-----?----- Clarendonian	Mohnian	
	-----10.8-----	-----12.3-----		
		14.4	Luisian	
15	Miocene	Barstovian	-----15.4----- Relizian	N/A
		-----16.4-----	-----16.7-----	
	-----18-----	Hemingfordian	Saucesian	
20		-----21.5-----		
		Arikareean	-----23.1-----	
24.6	-----24.6-----		Zemorrian	
25	Oligocene			

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N/A = Not applicable - no sedimentary units of this age in the vicinity of MBPP.

6.8.2.4 Project Design and Operational Features

While construction and demolition activities associated with the Project has a low potential to impact fossils, the following measures shall be incorporated into Project construction and demolition procedures so that no significant impact to important paleontological resources will occur.

During excavation, a qualified paleontologist shall periodically monitor the investigation area.

- In the event vertebrate, invertebrate or paleobotanical fossils are encountered during excavation, work shall be halted immediately and a paleontologist shall be retained. The paleontologist would investigate the finding, evaluate fossil materials and, if necessary, devise and implement a mitigation plan.
- If a mitigation plan were found to be necessary, it would follow the guidelines for paleontological mitigation provided by SVP.

6.8.3 MITIGATION MEASURES

Based on the above analysis of impacts and measures incorporated during Project construction and demolition activities, no mitigation measures are required.

6.8.4 SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

No significant unavoidable adverse impacts will occur to paleontological resources due to the construction or operation of the Project.

6.8.5 COMPLIANCE WITH LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

Applicable LORS related to the identification, assessment of significance, and mitigation of adverse impacts to paleontological resources are identified in Section 7.5.8. The paleontological field surveys and analysis at MBPP were conducted by an SVP qualified paleontologist, consistent with procedures for compliance described in the LORS. The design and construction features incorporated in the Project and included in this section will assure that the Project is in compliance with the LORS identified in Section 7.5.8 for paleontological resources. No specific permits for paleontological resources are required for the Project.

6.8.6 REFERENCES

Petra Paleontology. *Paleontological Resource Assessment, Morro Bay Power Plant Expansion, Morro Bay, San Luis Obispo County, California*. Prepared by F. Govean, Ph.D., for TRC. March 1999.